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SCIENTIFIC, EDUCATIONAL AND APPLICATIVE IMPORTANCE THE COLLECTION OF RARE PLANTS OF NATURAL FLORA OF BELARUS

Kruchonok A., Titok V.

Summary. Collection of rare and endangered plant species of the flora of Belarus is dynamically replenished with various samples; it contains a significant share of the list of the national Red List. The collection is the basis on which the theoretical and methodological principles of organizing a reserve gene pool of rare and endangered plants are created, it is a source of original material for repatriations, reconstructions and translocations, serves for educational purposes, and is included in the international diaspora exchange.

НАУЧНАЯ, ОБРАЗОВАТЕЛЬНАЯ И ПРИКЛАДНАЯ РОЛЬ КОЛЛЕКЦИИ РЕДКИХ И ИСЧЕЗАЮЩИХ РАСТЕНИЙ ПРИРОДНОЙ ФЛОРЫ БЕЛАРУСИ

Кручонок А. В., Титок В. В.

*Центральный ботанический сад Национальной академии наук Беларуси, Минск, Беларусь,
A.Kruchonok@cbg.org.by*

Резюме. Коллекция редких и исчезающих видов растений флоры Беларуси имеет полувековую историю в ЦБС НАН Беларуси, динамично пополняется образцами из природных мест обитаний; содержит значительную долю видов Красной книги Республики Беларусь. Коллекция является основой, на которой созданы теоретико-методические принципы организации резервного генофонда редких и исчезающих видов растений, является источником исходного материала для экологических репатриаций, реконструкций и транслокаций, служит в образовательных и просветительских целях, семенной материал является наиболее востребованным в международном обмене диаспорой между ботсадами.

Throughout the world, botanical gardens are centers for the conservation and study of the biodiversity of the world's flora, but the focus is currently on the problems of regional floras, on methods of conservation and restoration of native species. A special task at all times was the educational role of the botanical garden, as a place where everyone can be acquainted and study botanical rarities. The Collection 'Rare and endangered species of the natural flora of Belarus' in the Central Botanical Garden of the National Academy of Sciences of Belarus has the status of the National Treasure of the Republic of Belarus and has more than 45 years of history. It is the basis of the reserve gene pool of rare species for the needs of nature protection movements. The laying of the base of the Collection in the Central Botanical Garden of the National Academy of Sciences of Belarus began in 1976 simultaneously with the biogeocoenotic studies of the natural complexes of the Pripjat Landscape and Hydrological Reserve and Nalibokskaya Pushcha Refuge under the guidance of the Director, Academician N. V. Smolsky and Dr. A. V. Boyko. In those years, the importance of *ex situ* conservation of the gene pool of rare plant species was adequately assessed. The Collection was replenished not only from natural habitats, but also due to the receipt of seeds and living plants from foreign botanical institutions through the system of international exchange of diaspora.

Since 1983, under the leadership of Ivan V. Loznukho and Lidia V. Kukhareva carried out a comparative study of the ecological and biological characteristics of rare species, the development of methods for their reproduction. For the first time, methods of conservation movement were tested, and the resource potential of rare species was assessed.

In 2009–2014 the core of the Collection was updated by the curator Svetlana P. Torchik. She found decorative micro-groups of rare plants in the landscape of the Garden and created a magnificent landscape composition of rare plant species in the form of a rocky garden with decorative conifers [3]. Svetlana Torchik has developed and implemented a new direction, which is now the most trendy in modern landscape design – Decorative Garden of Rare Plants. An assortment of rare plants was proposed and clarified, studied the period of their decorative effect and the requirements for cultivation. To date, 34 species of rare and protected plants are used in landscape groups (11.2 % of the number of such species in the Red List of Belarus). The group IV (VU – vulnerable) of the rarity category is the most widely represented (24.1 %). These species allow creating a year-round decorative flower garden.

Today, the collection fund consists of 365 specimens representing 59 families, 161 genera and 231 plant species, including not only rare native species, but also plant species protected in neighboring states. The fund is 75 % of the number of species listed in the Red List of the Republic of Belarus. To date, a taxonomic revision of the collection fund has been carried out, extensive seed material has been replenished from natural habitats in chorological diversity, germplasm of indicator species of rare biotopes and typical plant communities is being collected.

The collection is maintained by the Plant Resources Conservation and Restoration Sector of the Plant Biodiversity Laboratory. Employees collect samples from natural habitats of rare plant populations, reserve germplasm in the form of seeds, spores, pollen and propagules to conserve the gene pool in *ex situ* conditions, conduct monitoring studies of endangered populations, and develop techniques and methods for restoring critically endangered populations. Phytoindicative methods for assessing environmental conditions have been successfully implemented to create reserve coenopopulations and supervise the development of new ones [1].

This collection of natural species meets the overall mission of botanical gardens, outlined at the congress of the BGCI (2019). With its scientific research work with the natural flora, the CBG contributes to:

- stop the loss of plant species and preserve their genetic diversity;
- concentration of efforts on prevention of further degradation of phytocoenoses;
- formation of public understanding of the value of plant diversity and the threats to which it is exposed;
- undertaking practical measures to preserve and improve the state of phytodiversity;
- to promote and ensure the long-term use of plant resources by present and future generations.

The Central Botanical Garden has all the necessary conditions to maintain the reserve gene pool of rare and endangered plants at the proper scientific level in the form of living specimens and a collection of seeds. *Ex situ* conservation has a number of advantages that are not always available in *in situ* conditions:

- concentration of plant diversity as source material localized in one place, under artificially controlled conditions;
- relative safety and guarantee of preservation;
- the possibility of consistent and purposeful study;
- operational availability for the user;
- centralized management, the possibility of data processing, the creation of a single database integrated into international databases;
- the possibility of constant accounting and control over the progress and quality of genetic material.

To meet these benefits, the reserve gene pool conservation structure has the following functional parts:

I. Field collection of rare plant species

Consists of specimens taken from the natural habitat as eloin objects, or grown from seeds, spores and propagules of natural origin. Also in the living collection there are individuals from the material obtained through the international diaspora exchange, which are important for determining the genetic status, comparative anatomical and morphological studies. Part of the living collection is grown separately in the exposition and serves to implement educational programs. Seeds produced by objects of this part of collection are stored in the biobank of the II block of the collection and participate in the international exchange of the diaspora.

II. Collection of seeds, spores and propagules

One of the forms of phytodiversity conservation in *ex situ* conditions is the maintenance of objects in seed banks. This part of the reserve gene pool is the most extensive and labor-intensive. This material is of great conservation importance, not all material can be transferred to Part I due to narrow environmental requirements, but the preservation of the gene pool is possible by renewal through restoration from seeds using biotechnological methods, subsequent adaptation under controlled conditions and transfer to *in situ*.

The seed bank is equipped with several storage systems:

- short-term storage at low positive temperatures (+4 °C);
- medium-term and long-term storage at medium low temperatures (–18–20°C).

At the objects of this part, research is being carried out to establish the types of organic and physiological dormancy and the accelerated exit from it of plants of different ecological groups, with species-specific features.

Since the number of seeds of rare and endangered plant species collected in natural conditions is very limited, methods are being developed and conditions are being selected to achieve the highest percentage of sample recovery.

The samples of the collection make it possible not only to study the ecological and biological features of the growth and development of vulnerable plant species in ex situ, but also to develop practical methods for their reproduction and conservation, and methodological approaches for restoring their natural populations. In some cases, the specimens kept in the CBG collection are the only representatives of the species gene pool in the country, because in places of natural growth, these populations have already disappeared. This is how, in recent years, in the course of the implementation of state scientific programs, the coenopopulations of the *Astrantia major* L., *Cirsium canum* M. Bieb have been restored. A project for the restoration of disturbed populations of *Cinna latifolia* (Trevir.) Griseb and *Carex umbrosa* L. has been prepared for implementation. Work has begun on the reconstruction of a unique population of *Tofieldia calyculata* (L.) Wahlenb., planting material was restored from seeds collected in nature, on the only population in the country, consisting of 8 individuals.

Replenishment of the collection has a clearly defined strategy and ideology. First of all, we replenish material from *in situ* conditions, from populations that are on the verge of extinction. The next most important group of species from the border areas, they are of great importance for international initiatives to protect endangered plants. So, on the seed material of the collection and seeds obtained by exchange from Lithuania, a study was made of the features of the collection and preservation of germplasm of 46 marsh species of the border areas of Belarus and Lithuania [2]. Next in terms of collectible value are species that are understudied and of uncertain status. Most often, species from this category fall into subsequent editions of the national Red List. Under CBG conditions, it is possible to study such taxa in detail.

Of great importance is the material obtained through the international exchange of seeds between botanical gardens, thanks to this system, specialists have the opportunity to compare the anatomical and morphological features and genetic status of rare plants from different points of their areal. In addition, through the exchange from neighboring countries, species with the category "0" (RE-regionally extinct – disappeared in the region) were replenished. They share a common areal and genetic affinity with extinct populations in Belarus. Thus, species that have disappeared from the flora such as *Sonchus palustris* L., *Gladiolus palustris* L., *Linum flavum* L. have been included in the collection and etc.

The conceptual scheme of interaction of the reserve gene pool of rare and endangered plant species of the flora of Belarus with the centers of reintroduction and renaturalization of specially protected natural areas has been determined. Many projects for the restoration of extinct cenopopulations have become possible thanks to this work. The collection also serves as a base for educational programs, students of republican and Minsk universities have internships here, classes are held with students of schools and ecological centers.

Summing up, we can say that the Collection of rare and endangered plant species of the flora of Belarus is dynamically replenished with various samples; it contains a significant share of the list of the national Red List. The collection is the basis on which the theoretical and methodological principles of organizing a reserve gene pool of rare and endangered plants are created, it is a source of original material for environmental repatriations, reconstructions and translocations, serves for educational purposes, and is included in the international diaspora exchange.

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